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The problems of conducting research in schools are discussed. Solutions to social psychological problems are suggested, and an improved design for research is recommended. Clearer definition of terminology is recommended to avoid the confusion that can result from ambiguous terms. A research design should be adaptable to the administrative and instructional styles of individual schools. The researcher should observe the proper hierarchy in gaining permission to conduct research and should report results immediately. Deadline dates and specifications of event sequences with names of responsible persons are requisites for successful interpersonal relations. The following steps are recommended to avoid the frequent failure of educational research to improve educational practice: formulation, instructional specifications, component preparation and tryout, product preparation, quality verification, and operations analysis. (BS)

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Conducting Research in School Systems[1]

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Dr. Hayman addressed you this morning from the vantage point of a person who has seen many researchers thrown out of schools. I follow him as a researcher who has been thrown out of many schools. Although our experiential bases differ, I presently see things much the same way John does. As John implied, the bounce of a researcher is usually figural rather than literal, but the consequences are similar--inaccurate or incomplete data.

I must admit that the problems Dr. Hayman spoke to were not the sort I anticipated when I agreed to discuss designing research to meet the problems he raised. The social psychological problems that John enumerated are not conventionally included in discussions of either reading research or general research methodology. In fact one is hard-pressed to find any admission of their existence. Yet, I concur completely that interpersonal relations are necessary, if not sufficient, considerations in conducting research in school systems. One cannot meet such problems through research design; people design is required. Ideally, I'd recommend one try to avoid rather than meet interpersonal problems. But since John was brave enough to raise social psychological problems I will try to deal with such aspects of them as I can before returning to more familiar design territory. You will note that while I accept Dr. Hayman's identification of the determinants of the problems, I disagree with some of his suggested solutions.

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As Dr. Hayman implied, a school researcher must develop educational theological competence as well as scientific competence. Education currently rests professionally on a theological rather than a theoretical foundation. It is easy for a researcher to stumble unwittingly over some currently hallowed dogma. For example, I've learned to use Piaget and Bruner as positive word weapons, like mother and apple pie, as well as data references. "Inquiry learning" and "interpersonal sensitivity" are also currently on the side of good rather than evil in most quarters. But you have to be careful to respond to denominational slogan peculiarities within the theological framework. Phonics in some school districts is very good, in other districts neutral or negative.

In general, the school researcher must live with a conceptual deprivation which his predecessors have cheerfully condoned and nourished. This conceptual deprivation is far more debilitating than cultural deprivation. Terms like "comprehension," "dyslexia," and "blending," to mention only a few, do have meaning. But the associated referents are either other abstractions or ambigious operations. The apparent specificity such terms provide is misleading at best. Consider the term "bilingual," which is a focus of a good deal of educational, social, and political attention at the moment. The term incorporates both dialect and literacy considerations. Permuting these, Joseph Follettie in our Laboratory has distinguished 48 different instructional outcome referenced options ranging from Monolingual, standard dialect, illiterate as one condition to bilingual, bidialectic, standard and substandard Spanish, standard and substandard English, biliterate. With one term referring to 48 different conditions, one inevitably encounters communication difficulties among professionals. The

solution lies in cleaning up conceptual relationships rather than in cleaning up interpersonal relationships. Thus the most direct route is via logical analysis rather than psychoanalysis.

As John so clearly impressed upon us, the school is not a research institution. The responsibilities of the teacher differ from those of the researcher. This makes reading research particularly difficult. Since reading is almost universally regarded as a high priority objective, school people naturally feel a high degree of responsibility for "protecting the child" in this area. Thus, even when all concerned recognize that overall instructional effectiveness in reading is low, there is a general reluctance to introduce any manipulations for fear things will deteriorate even further. This "drowning man" syndrome is particularly evident in reading research as compared to research in other school subjects.

John recommends "successful compromise" to resolve such problems. I would prefer negotiation to compromise. Design validity is akin to pregnancy. It is the researcher's responsibility to generate a completely "clean" design that is feasible to the responsibile school people. The operational responsibilities of the schools preclude their bending much. If the researcher cannot produce a research design that permits him to generate the observations he requires in a manner the school people can manage, the quicker he folds his tent the better for all concerned. It is neither reasonable nor feasible to attempt to conduct all reading research under natural school conditions.

I have found that districts vary tremendously in their administrative and instructional styles. In some districts it is possible for a researcher

to "get by" with much less attention to interpersonal relations than in others. However, I have found the following "before and after" professional courtesies are always in good taste. First, a school district is a highly developed bureaucracy. Start at the top with the superintendent's office. You may never have to see the superintendent per se. But the superintendent has to have an opportunity to know what's going on. If you don't provide him this opportunity and anything goes wrong, expect no mercy from anyone and expect that whoever goes into the district to request research cooperation the next time will encounter increased resistance. Similar respect for whatever administrative red-tape the district imposes is a necessity. A researcher seldom enjoys this process, but it is a necessary price for continuous cooperation. Consider "after." A researcher is inclined to have a short memory after a study is completed. The preparation of the research report may take some time, and it is seldom prepared in a form that is comprehendible to school people. It is indeed "extra work" to report back either in oral or written form the findings of the study as soon as possible after the study is completed. But unless this is done, the school people have a perfect right to feel that they were simply "used" to advance the personal interests of the researcher. Professional courtesy demands better treatment of school people than most researchers like to extend. I've found that school people typically respond beyond the call of professional duty when one treats them as intelligent human beings rather than as "sources for subjects." A researcher would resent being viewed merely as a source for "design and analysis."

Note that treating school people as people is only a prerequisite.

Dale Carnegie is no substitute for Sir Ronald Fisher. Dr. Hayman comes perilously close at times to implying that interpersonal relations are ends rather than enablers. For example: "Teachers need to identify with the project and its purposes. They must be involved to the extent possible in designing experimental procedures and in planning for the implementation of procedures which are necessarily designed by someone else. They must be made to feel an integral part of what is happening."

Teachers must not only feel a part of what is happening, they <u>are</u> what is happening. This does not mean, however, that they have a contribution to make at every stage of the research. Education needs further, rather than less, specialized division of labor. Many authorities in teacher education and graduate training equate cooperation with contribution. It is professionally sad that the skills of many teachers and researchers are indistinguishable when the roles of each have become distinctly more complicated since the days in which many school people received their formal professional training. To insist that a teacher and/or principal be present or involved in every aspect of a study is an unreasonable concession to educational bureaucracy.

The educational research community, of course, has a matching bureaucracy. I can attest from personal experience and from observing others that throwing together a <u>team</u> of say a teacher, a statistician, a psychometrician, a liberal arts scholar, and a curriculum specialist and expecting something to get done, is a wishful expectation. These <u>roles</u> are essential ingredients, but converting roles into outcomes requires a management and technological sophistication that we have not yet achieved in education.

Dr. Hayman devoted considerable attention to "problems of communication." I must admit that I feel that the term, "communications" is getting tired from over-use. Or more accurately, I'm getting tired of hearing "communication problem" used as a pseudo-explanation of so many current problems. The explanation is too inclusive and abstract. With language an inevitable concomitant of human endeavors, one can smugly cite a "communications problem" for anything that goes wrong in any sector of human interaction. On the other hand, I heartily endorse ambiguity reduction in communication. As steps in this direction I recommend deadline dates, and the specification of ordered sequences of events accompanied by specific names of persons responsible for specific requirements. I also highly recommend trying out any written communication on a couple of people to test the variability of the reactions it evokes. I've found that other people are remarkably <u>reliable</u> in their misunderstanding of my crystal clear communications. It's my validity problem, not their reliability.

Dr. Hayman is equivocal on the concept of feedback: "Seldom will the curriculum materials and the instructional techniques being researched be perfect and changes may be needed while the project is in progress. Making changes during the course of a project violates the classical experiment notion, of course, but may be a necessary trade-off to assure that children receive the most effective instruction possible." The distinction which Michael Scriven makes between formative and summative evaluation should help John's guilt in this area. There is an impressive research tradition in such productive fields as chemistry and biology for "making changes in the course of a project" as a means of evaluating a phenomenon

during some stage of development. Moreover, there are established procedures for insuring the dependability of such systematic or initially adventitious probes. For a treatment of such procedures I recommend Murray Sidman's Tactics of Scientific Research. The end result expected from such manipulations is an improved product--in our context more dependably produced instructional outcomes. This contrasts with summative evaluation which relates to the evaluation of finally developed educational programs. Here the expected end result is a set of descriptive statements about a single program or about the relative merits of two or more programs. Even in a summative evaluation context it is still perfectly feasible "to make changes needed while the project is in progress." The only requirement is that whatever procedures and materials were used be accurately and fully described. One has a completely free hand in science -- at least the way I play it -- so long as he maintains a record which permits replication of whatever he does.

One final quibbly solution before I present a big-problem solution, which casts all of the foregoing in a worms-eye perspective. This relates to what John labels the particularly vexing problem in obtaining a suitable sample. The inconsistency is reflected in the following sentence "The researcher will ordinarily be concerned with the behavior of individuals, and he will therefore want to select his sample by individuals." Wrong! I guess the best reference to why is the Campbell and Stanley chapter in the Handbook of Research on Teaching. Simply because a researcher is interested in individuals is no rationale for treating instruction as if it were individualized. So long as instruction is under the direction of a teacher with the class working as a group, rather than completely independently at

all times, the unit of interest is by definition the class, not the individual pupil. This, however, is in most ways a gain rather than a loss. For example, it is much more feasible to randomly assign intact classes to experimental treatements than it is to assign individuals at random. The effect of so doing on the statistical significance levels which John worries about is not so great as he implies, since one picks up added reliability in statistically analyzing mean scores rather than individual scores. Thus, we find that good school people and good statisticians happily come out quite close in their recommendations on this point.

The use of the class rather than the individual as the experimental unit also reduces the differential mortality problem which John raises. It's not a complete solution, and again I refer you to the Campbell-Stanley discussion. I would point out, however, that analysis of covariance, which John states can help out, cannot help out.

So much for my solutions to the problems John raised. John's concerns with interpersonal relations and common courtesy led him to avoid raising one nasty, but inescapable problem--the utility of educational research. We have all nurtured the polite fiction for too long that educational research is a direct route to educational improvement. There is no evidence to support the contention that educational research leads to improved educational practice. Nor does such a relationship hold for fields other than education. Research is transformed into a practical, useful form via operations conventionally labeled development. While there are elaborate and sophisticated technologies of development in other fields, in education we use the term R&D as if it were a single concept, with the activities

encompassed by the term almost exclusively research rather than development. Please note that I am in no way disparaging the value of educational research. It is simply that research is directed toward increased knowledge rather than improved practice. The increased knowledge resulting from research may be useful in producing products with social utility, but it is not equivalent to such products. The distinction between research, development, and school practice is analogous to the distinction between conducting an aerodynamics experiment in the physics laboratory, developing the SST, and piloting a 707. Here it is obvious that different operations are involved. But education has created no such division of function and responsibility. Physics, engineering, and piloting are not interchangeable, but educational research, development, and instruction are often considered as if they were.

To give you some indication of the nature of development as I'm using the term, I should like to describe the instructional development procedures being followed at the Southwest Regional Laboratory for Educational Research and Development. I won't be describing the Laboratory program, only the procedures we make use of in applying what we refer to as the self-correcting mechanism to instructional product development. That is, we take it for granted that no materials and procedures, either in education or in other fields, will work perfectly the first time they are tried out. An iterative sequence of trial-revision cycles is required to successively eliminate defects until the product functions at an appropriate effectiveness level. I will be describing the procedures briefly, but it seems to me that they may represent the basis for a generalized solution to the problems of conducting research in the schools.

Formulation represents the first stage in "closing the gap" between research and practice. There are always many new and attractive "ideas" available, but they always require some work to generate a base for further instructional development. Formulation usually begins with conceptual activities to identify the most powerful manipulable variables in an area which can then be woven into a broad instructional strategy. These conceptual activities should culminate in a set of instructional specifications.

Instructional specifications include, but are not limited to, sequenced statements of desired instructional outcomes. Each objective must also be accompanied by specifications for requisite entry behavior, by specifications for testing if the outcome is attained, by specifications for the media by which the instruction is to be presented, the specific conditions under which practice must be given to assure the behavior does occur, and inappropriate conditions under which the behavior must not occur. This is a much more complicated analytic task than simply stating a terminal behavioral objective, which is difficult enough in education. A terminal objective, however, represents the beginning rather than the end of instructional development.

The component preparation and tryout involves the initial tryout of component materials and methods which relate to various aspects of the instructional specifications. Often the prototype materials and methods are in a "mockup" form which only approximates the expected finished product. However, any prototype must be in a form amenable to replication; the designer may not specify that a "creative" or "well-educated" teacher is required without indicating precisely how such creative behavior can be assured.

The tryout of components involves three kinds of activity. First, the administration of criterion-referenced tests to a representative target sample to obtain some indication of the difficulty of attaining the instructional outcomes with the target learner population. Second, it is usually desirable at this stage to try out instructional components with a single learner or a single group of learners. Any prototype instruction is inevitably based on implicit initial assumptions about both the target population and instructional components. Both university professors and classroom teachers tend to invest instruction with greater meaning than it possesses for a child since they typically assume an isomorphic relationship between their perception of a given segment of instruction and the child's perception of the same situation. For example, the simple simultaneous presentation of a blue triangle and a red circle may be seen as teaching classification, color, geometry, set theory, visual perception, arithmetic readiness, inquiry behavior, inference, and a host of other high prestige terms. The greater the quantity of abstractions the adult can attach to the instructional stimuli, the happier and more educated he assumes the child will be. The initial tryout under simulated conditions tests these assumptions and provides a practical and efficient basis for working out a number of "bugs" and for identifying the child's reactions to the instruction. The earlier this initial tryout occurs, the better.

Third, the component tryout provides an occasion for experimentation with important identifiable separable aspects of the instruction, such as the nature of illustrations, book size, clarity of directions, and presentation mode.

Product preparation involves combining and extending the prototype components into instruction suitable for classroom tryout. This involves more than assemblyline operations. It also involves the introduction of motivational devices -- fun and games -- to make the instruction attractive to pupils and manageable for teachers. This is not easy to do. It is possible to produce highly concentrated drill and practice which has no motivational appeal. It is also possible to produce highly motivating fun and games with no instructional value. The technology for producing instruction which is both highly efficient and highly motivating is still primitive.

Quality Verification involves the successive trial-revision cycles required to bring a product to an acceptable level of performance under complex, real-world conditions. As I've already indicated, no product is likely to function adequately the first time it is tried out. Several corrective cycles are required to identify and eliminate defects until the product adequately satisfies the user's needs. Quality verification tryouts are performed by regular school personnel under standard school conditions. Such tryouts are not demonstrations; special visibility is minimized.

A final step which we call operations analysis refers to the successive refinement of the foregoing steps in instructional development. This is almost absent in American education. Yet it is the principal yield of science and technology in other sectors of life where the invention of the method of invention occurred during the nineteenth century. With an effective operations analysis one always has his "next generation" product underway before his "current generation" product is fully installed. This

progressive accumulation of efficiency requires both a criterion-referenced outlook and a continuous development operation which has not heretofore existed in education. It is in the operations analysis area where it seems to me that "curriculum" divisions of school systems could function most effectively if they possessed appropriate skills and orientation.

In sum, there are indeed unique problems associated with conducting research in schools. Many of these can be avoided by conducting the research more efficiently outside the classroom. Others can be smoothed out by greater attention to interpersonal relations and more creative research designs. Bigger and better solutions are being created by increased investments of time and energy in the new empirical frontier of educational development.

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